AW

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/057,455	04/09/1998	TAKEHIKO HAMADA	19680-01	6428

466 7590 12/23/2003

YOUNG & THOMPSON
745 SOUTH 23RD STREET 2ND FLOOR
ARLINGTON, VA 22202

EXAMINER	
BERMAN, JACK I	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 12/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

AW

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450
www.uspto.gov

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 17

Application Number: 09/057,455
Filing Date: April 09, 1998
Appellant(s): HAMADA, TAKEHIKO

MAILED
DEC 23 2003
GROUP 2800

Thomas W. Perkins
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed October 7, 2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is substantially correct. The changes are as follows:

Since claims 1-14 have not been canceled, only "withdrawn from this appeal", they are still present in the application and the issues are whether claims 6, 12, and 20 are indefinite under 35 U.S.C. §112, second paragraph, for including contradictory limitations;

whether claims 1-4 and 7-10 are unpatentable under 35 U.S.C. §103(a) as being obvious over Munakata in view of Kato et al. and Ichihashi et al.;

whether claims 5 and 11 are unpatentable under 35 U.S.C. §103(a) as being obvious over Munakata, Kato et al., Ichihashi et al., and Todokoro et al.;

whether claim 15 is anticipated under 35 U.S.C. §102(b) by Peckerar; and

whether claims 13, 14, and 16-18 are unpatentable under 35 U.S.C. §103(a) as being obvious over Munakata, Kato et al., Ichihashi et al., and Peckerar et al.

(7) Grouping of Claims

The rejection of claims 1-4 and 7-10 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

The rejection of claims 5 and 11 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

The rejection of claims 13-19 stand or fall together because appellant's brief does not include a statement that this grouping of claims does not stand or fall together and reasons in support thereof. See 37 CFR 1.192(c)(7).

(8) Claims Appealed

Claim 1-14 contain(s) substantial errors as presented in the Appendix to the brief. Accordingly, claims 1-14 are correctly written in the Appendix to the Examiner's Answer.

(9) Prior Art of Record

3,535,516	MUNAKATA	10-1970
4,039,829	KATO et al.	8-1977
4,219,731	MIGITAKA et al.	8-1980

4,581,534	TODOKORO et al.	4-1986
4,600,839	ICHIHASHI et al.	7-1986
5,703,373	PECKERAR et al.	12-1997

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 6, 12, and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. These claims all contain limitations that contradict limitations in the claims from which they depend. Claims 6 and 12 claim that either secondary or reflected electrons are detected and that the positions of the electron beam at the start of the scan and at the time the amount of these detected electrons change are used to measure the size of the portion to be measured, a process which inherently involves detecting the position of this portion; however, these claims depend from claims 1 and 7, respectively, which claim that the detection of secondary or reflected electrons are not involved in detecting the position of the portion to be measured. This is a contradiction. Claim 20 claims a position detecting system configured to detect the position of a gate electrode on a gate oxide film covering a device region confined in a surface of a silicon substrate; however, claim 20 depends from claim 15 which claims a system for detecting the position of the bottom of a contact hole through an insulating film on a silicon substrate. Since a gate electrode on a gate oxide film covering a device region confined in a surface of a silicon substrate is not the bottom of a contact hole through an insulating film on a silicon substrate, this is also a contradiction.

Claims 1-4 and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munakata in view of Kato et al. and Ichihashi et al. Munakata discloses a method and apparatus for generating an image of a specimen comprising a voltage applying means 15 which applies a voltage to a sample 6 while an electron beam 16 is scanned across the sample and the resultant current induced in the sample by the electron beam is detected and correlated with the position of the electron beam to generate an image of the sample. Kato et al. teaches that such apparatus can be used to measure distances between points on the sample. One of the measurement methods taught by Kato et al., as summarized at lines 26-30 in column 2, involves determining the position of a mark on the sample image by measuring the delay between a beam scanning start time and the time at which the scanning electron beam reaches the position represented by the mark. According to Kato et al., the size of any given feature on the specimen can be measured by making a mark on opposing edges of the feature and measuring the distance between the two marks. Ichihashi et al. teaches that instead of the operator arbitrarily choosing two marks to indicate a distance to be measured, means can be provided to select the opposing edges by detecting the changes in the signals generated by the interaction of the electron beam and the specimen. While both Kato et al. and Ichihashi et al. illustrate embodiments of their inventions wherein either secondary or reflected electrons are detected, both patents state (Kato et al. at lines 11-20 in column 1 and Ichihashi et al. at lines 5-8 in column 3) that any signal generated by the interaction of the electron beam and the specimen can be used. Munakata teaches at lines 27-32 in column 1, that specimen currents are known in the art to be equivalent to back-scattered or secondary electrons for purposes of detection in scanning electron microscopes to indicate the

interaction of an electron beam with a specimen. Munakata et al. also teaches, at lines 19-26 in column 5, that it is not necessary to detect secondary or reflected electrons while an electric current induced in the specimen as it is scanned with the electron beam is detected. It would therefore have been obvious to a person having ordinary skill in the art to use Kato et al.'s measuring system to measure distances between points observed using the Munakata scanning electron microscope with changes in the detected signals being used to indicate the points to be measured, in the manner taught by Ichihashi et al.

Claims 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munakata, Kato et al., and Ichihashi et al. as applied to claims 1-4 and 7-10 above, and further in view of Todokoro et al. Todokoro et al. teaches at lines 56 in column 1 through 14 in column 2 that the presence of passivation layers on integrated circuits creates a capacitance that prevents the observation of DC voltages in the integrated circuits by scanning electron microscopes. According to Todokoro et al., the way to overcome this problem is to periodically vary the bias voltage applied to the integrated circuit sample. It would therefore have been obvious to a person having ordinary skill in the art to periodically vary the bias voltage applied to the sample in the Munakata/Kato et al./Ichihashi et al. method and apparatus discussed above in order to overcome the capacitance problem disclosed by Todokoro et al.

Claim 15 is rejected under 35 U.S.C. 102(b) as being anticipated by Peckerar et al. As is explained at lines 22-34 in column 4, line 14 in column 7 through line 11 in column 8, and illustrated by EXAMPLE 1 at lines 19-59 in column 8, Peckerar et al. discloses a position detecting system for detecting the bottom of contact holes (apertures 16) through an insulating film (electron beam absorber layer 12) on a silicon substrate (illustrated in Figure 6) by scanning

an electron beam across the surface of the substrate while applying a voltage to the rear surface of the substrate (as is also illustrated in Figure 6) so that a current is detected through the substrate only when the electron beam strikes one of the apertures in the insulating film.

Claims 13, 14, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Munakata, Kato et al., and Ichihashi et al. as applied to claims 1-4 and 7-10 above, and further in view of Peckerar et al. Munakata does not describe in detail how the bias voltage is applied to the specimen or where the current detecting means detects the current in the specimen, it would therefore have been obvious to a person having ordinary skill in the art locate the means for performing both these functions on the bottom of the sample in the manner taught by Peckerar et al. As was explained in the previous office action, Kato et al. teaches that scanning electron beam systems, such as that disclosed by Peckerar et al., can be used to measure distances between points on the sample. One of the measurement methods taught by Kato et al., as summarized at lines 26-30 in column 2, involves determining the position of a mark on the sample image by measuring the delay between a beam scanning start time and the time at which the scanning electron beam reaches the position represented by the mark. According to Kato et al., the size of any given feature on the specimen can be measured by making a mark on opposing edges of the feature and measuring the distance between the two marks. Ichihashi et al. teaches that instead of the operator arbitrarily choosing two marks to indicate a distance to be measured, means can be provided to select the opposing edges by detecting the changes in the signals generated by the interaction of the electron beam and the specimen. While both Kato et al. and Ichihashi et al. illustrate embodiments of their inventions wherein either secondary or reflected electrons are detected, both patents state (Kato et al. at lines 11-20 in column 1 and

Ichihashi et al. at lines 5-8 in column 3) that any signal generated by the interaction of the electron beam and the specimen can be used. Munakata teaches at lines 27-32 in column 1, that specimen currents are known in the art to be equivalent to back-scattered or secondary electrons for purposes of detection in scanning electron microscopes to indicate the interaction of an electron beam with a specimen. It would therefore have been obvious to a person having ordinary skill in the art to use Kato et al.'s measuring system to measure distances between points observed using the Peckerar et al. scanning electron microscope with changes in the detected signals being used to indicate the points to be measured, in the manner taught by Ichihashi et al.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Peckerar et al., Munakata, Kato et al., and Ichihashi et al. as applied to claims 13, 14, and 16-18 above, and further in view of Todokoro et al. As is explained above, Todokoro et al. teaches at lines 56 in column 1 through 14 in column 2 that the presence of passivation layers on integrated circuits creates a capacitance that prevents the observation of DC voltages in the integrated circuits by scanning electron microscopes. According to Todokoro et al., the way to overcome this problem is to periodically vary the bias voltage applied to the integrated circuit sample. It would therefore have been obvious to a person having ordinary skill in the art to periodically vary the bias voltage applied to the sample in the Peckerar et al./Munakata/Kato et al./Ichihashi et al. method and apparatus discussed above in order to overcome the capacitance problem disclosed by Todokoro et al.

(11) Response to Argument

Appellant does not argue with the rejection of claims 1-14, so these rejections should stand.

Appellant argues that Peckerar et al. does not disclose the "position detecting means" claimed in claim 15. Instead, according to appellant:

> "Peckerar et al. already know the position of the apertures in the fiducial pattern and [are] only concerned with the position of the electron beam relative to the film on which the beam makes a useful image since they want to be sure that the beam is in the correct position on the film when making the image."

However, it must be noted that Peckerar et al. finds the "position of the electron beam relative to the film" by finding the position of the electron beam relative to fiducial electron beam detectors that are at known positions on the workpiece on which the film is deposited. Since Peckerar et al.'s fiducial electron beam detectors inherently comprise the bottoms of holes 16 through an insulating film 12, appellant's argument is basically that the claimed function of "detecting the position of the bottom of said contact hole, with reference to the scanning start position of said electron beam and the position when the detected current changes," is different from Peckerar et al.'s function of detecting the position of a scanning electron beam with respect to the position of the bottom of a hole through an insulating film. This argument is unconvincing because knowledge of the position of object A (the electron beam) relative to object B (the hole) inherently also indicates the position of object B relative to object A. This is implicitly recognized by Peckerar et al. at lines 5-8 in column 8 of the patent which discuss a modification

of the means for detecting current flow through the workpiece as the electron beam scans across it "to improve the ability to locate the leading and/or trailing edges of the apertures 16."

With respect to the rejection of claim 20 under the second paragraph of 35 U.S.C. 112, appellant argues that claim 20 is definite because it claims a system which can detect both the bottom of a contact hole and a gate electrode on a gate oxide film. However, the requirements for the system for detecting the bottoms of contact holes claimed in claim 15 and the requirements for the system for detecting a gate electrode on a gate oxide film claimed in claim 20 are mutually exclusive. Claim 15 requires: "a voltage applying means for applying a voltage to a rear surface of said silicon substrate which is scanned by said electron beam, so that when said electron beam is bombarded onto a surface of said insulating film, an electron current does not flow in said silicon substrate...." No limitation is placed on the insulating film other than that it be insulating. Claim 20, on the other hand, claims: "when said electron beam is bombarded onto said gate oxide, ...said electric current flows in said circuit component as the result of said electron beam that flows as said electric current through said gate oxide film, said device region and said silicon substrate to said voltage applying means because of the voltage applied to said rear surface of said silicon substrate...." Since an oxide film is inherently an insulating film and nothing in claim 15 excludes any type of insulating film, claim 20 requires that the voltage applied to the rear of the silicon substrate be set so that when the electron beam bombards the oxide film, an electric current both flows and does not flow through the substrate. This is clearly impossible.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,
Jack I. Berman
Jack I. Berman
Primary Examiner
Art Unit 2881

jb
December 18, 2003

APPENDIX

Claims 1-14:

1. A position detecting system comprising a beam irradiating means for irradiating an electron beam to a sample including a portion to be measured, a beam scanning means for relatively scanning the electron beam so that the electron beam moves in relation to the portion to be measured in the sample, a voltage applying means for applying a voltage to the sample which is scanned by the electron beam, a current detecting means for detecting a current flowing in the sample as the result of the electron beam that flows as an electric current through the sample to said voltage applying means because of the applied voltage, and a position detecting means for detecting the position of the portion to be measured with reference to the scanning start position of the electron beam and the position when the detected current changes, the position of the portion to be measured being detected without detecting secondary electrons and reflected electrons.

2. A position detecting system claimed in Claim 1 wherein the position detecting means is configured to detect the position of the portion to be measured with reference to the scanning start position of the electron, on the basis of the scanning start time of the electron beam and the detected current changing time.

3. A position detecting system claimed in Claim 1 further including a size measuring means for measuring the size of the portion to be measured, on the basis of a difference in the coordinates between two positions detected by the position detecting means.

4. A position detecting system claimed in Claim 1 further including a size measuring means for measuring the size of the portion to be measured, by multiplying a scanning speed of the electron beam by the time during which the current is at a changed level.

5. A position detecting system claimed in Claim 1 wherein the voltage applying means periodically changes the voltage applied to the sample.

6. A position detecting system claimed in Claim 1 further including an electron detecting means for detecting at least one of the secondary electrons and the reflected electron from the sample, and a measuring means for measuring the size of the portion to be measured on the basis of the scanning start position of the electron beam and the position when the amount of the detected electrons changes.

7. A position detecting method comprising the step of irradiating an electron beam to a sample including a portion to be measured, relatively scanning the electron beam to cause the electron beam to move in relation to the portion to be measured in the sample, applying a voltage to the sample which is scanned by the electron beam, detecting a current flowing in the sample as the result of the electron beam that flows as an electric current through the sample to said voltage applying means because of the applied voltage, and detecting the position of the portion to be measured with reference to a scanning start position of the electron beam and the position where

the detected current changes, the position of the portion to be measured being detected without detecting secondary electrons and reflected electrons.

8. A position detecting method claimed in Claim 7 wherein the position of the portion to be measured is determined with reference to the scanning start position of the electron, on the basis of the scanning start time of the electron beam and the detected current changing time.

9. A position detecting method claimed in Claim 7 wherein the size of the portion to be measured is determined on the basis of a difference in the coordinates between two positions detected by the position detecting means.

10. A position detecting method claimed in Claim 7 wherein the size of the portion to be measured is determined by multiplying a scanning speed of the electron beam by the time during which the current is at a changed level.

11. A position detecting method claimed in Claim 7 wherein the voltage applied to the sample is caused to periodically change.

12. A position detecting method claimed in Claim 7 wherein at least one of the secondary electrons and the reflected electron from the sample, is detected, and the size of the portion to be measured is measured on the basis of the scanning start position of the electron beam and the position when the amount of the detected electrons changes.

13. A position detecting system claimed in Claim 1, wherein the voltage applying means applies the voltage to a bottom of said sample which is scanned by said electron beam.

14. A position detecting system claimed in Claim 1, wherein the current detecting means detects said current flowing in the sample from a bottom of said sample which is scanned by the electron beam.